DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

Facility Name:	UNITED STATES NAVAL ACADEMY
Facility Address:	181 WAINWRIGHT RD, ANNAPOLIS, MD
Facility EPA ID #:	MD0170022602

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

X If yes - check here and continue with #2 below.

____ If no - re-evaluate existing data, or

____ if data are not available skip to #6 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e.,

RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air media known or reasonably suspected to be "contaminated"[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	X			See explanation below [a]
Air (indoors) [2]		X		See explanation below [b]
Surface Soil (e.g., <2 ft)		X		SVOCs and metals [c]
Surface Water		X		See explanation below [d]
Sediment	X			SVOCs and metals [e]
Subsurf. Soil (e.g., >2 ft)		X		SVOCs and metals [f]
Air (outdoors)		X		See explanation below [b]

☐ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

☒ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

☐ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale:

USNA was the subject of three investigations under the EPA Corrective Action Permit: the Verification Investigation (1992 VI), the Phase I RFI(1996) and the Phase II RFI (2000). The VI investigated groundwater as related to the three SWMUs (6, 8, and 13), and the two AOCs (AOC 3 and AOC 4). In 2002, a human health risk assessment was completed of the sediments in Shady Lake and fish and crab receptors. The risk analysis of the July 2002 fish and crab tissue data revealed risk levels within EPA acceptable limits for expected exposure to fish and crab in Shady Lake.

a.1. The VI identified groundwater contamination through 16 monitoring well network including 13 at SWMU 6 and 8, and 3 at SWMU 13.The VI identified constituents of concern above drinking water maximum contaminant levels (MCLs) for Total metals: antimony, arsenic, beryllium, cadmium, chromium, lead, and mercury; none of the Dissolved metals exceeded the MCLs. No further action was determined for
SWMU 6, and AOC 3, and AOC 4. SWMUs 8 and 13 were retained for further groundwater investigation

a.2. Further groundwater sampling conducted during the Preliminary RFI (Phase I) in August 1996 showed that total metals were elevated above the MCLs for antimony and arsenic. However, no other constituents exceeded the MCLs. Inorganic levels in the groundwater samples from the Preliminary RFI indicate minimal impact from the site. Also, the presence of elevated total dissolved solids (TDS) and total suspended solids (TSS) may have influenced the inorganic levels in the silty groundwater samples. No VOCs or SVOCs have been identified at levels above MCLs during any groundwater sampling event. However, SWMU 13 remained a concern since lead and other constituents were detected in

concentrations greater than the PQLs in groundwater, and additional investigation was begun .

a. 3. Groundwater sampling was conducted again at the facility in February 2000. This sampling was conducted as part of the Phase II RCRA Facility Investigation. Groundwater samples were collected from the three on-site monitoring wells at SWMU 13. The well designations are: U13-MW01, U13-MW02, and U13-MW03. One sample from U13-MW01 showed lead at a concentration of 21.2 µg/L. The lead action level is 15 µg/L for household plumbing systems. Groundwater samples collected from the other two on-site monitoring wells did not exhibit lead levels above the action level. No other constituents including semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, or target analyte list (TAL) metals were present at concentrations above their Maximum Contaminant Levels (MCLs). Shallow groundwater is not currently used as a water supply for the USNA or the surrounding areas. The primary water supply in the area is the city of Annapolis municipal water supply.

b. Air sampling was not conducted during any of the previous environmental investigations at the facility. SWMU 13 was a former incinerator, which was removed from service in 1937. SWMU 13 is approximately 4.5 acres that is currently grass covered with adjacent housing units, and a wooded area that slopes steeply downwards to Shady Lake in the northern portion of the site between the current fence line and Shady Lake. There is no longer any operating facility or unit present and, therefore, no continuing air emissions. No volatile organics have been detected in the soil or groundwater at levels of concern at the facility. There are currently no indoor or outdoor air issues at SWMU 13.

c. During the Phase II RCRA Facility Investigation, surface soil samples were collected from fifteen locations in the area of SMWU 13 from 0-6" below ground surface (bgs). Four of the fifteen surface soil samples are located between the fenced area and Shady Lake . These samples were analyzed for target compound list (TCL) SVOCs, PAHs, pesticides, PCBs, TAL metals, and cyanide. This area is not easily accessible to nearby adult or children residents due to the presence of high fencing (around a portion of Shady Lake) and overgrown trees and brush. The area beyond the fencing also slopes steeply downward to Shady Lake. The high fencing, overgrown brush, and the steep slope makes this area very difficult to access, and undesirable as a pathway to Shady Lake. Four samples are located immediately adjacent to the fence line and were analyzed for TAL metals and cyanide. These samples locations are also not accessible to the public. Four samples are located in the grassy area between the fence and the playground. These samples were analyzed for SVOCs, PAHs, pesticides, and PCBs. The remaining three surface samples were collected from areas adjacent to USNA housing units and analyzed for lead only. The results of the surface soil sampling determined showed the following:

1. **SVOCs** – benzo(a)anthracene, benzo(a)pyrene, and dibenz(a,h)anthracene were identified at concentrations above the EPA Region III Risk-Based Criteria (RBC) for residential exposure at sampling locations inside the fence line. The industrial RBC was exceeded for benzo(a)pyrene only;

2. **Pesticides** – dieldrin was identified in one sample at a concentration slightly above the residential RBC inside the fence line. No industrial RBC was exceeded for pesticides; and

3. **Metals and Cyanide** – arsenic, chromium, iron, lead, and mercury were found at levels exceeding the residential RBCs within and along the fence line. The industrial RBC was exceeded for arsenic and lead.

d) Three surface water samples were collected from Shady Lake and analyzed for TCL, SVOCs, PAHs, pesticides, PCBs, TAL metals, and cyanide. The criteria used to compare surface water concentrations is 10 times the EPA Region III tap water RBC (10XRBC). No constituents were found at concentrations above this criteria in Shady Lake surface water.

e) Surface sediment samples were collected from 0-6" below the lake bed. Subsurface sediment samples were collected from 2-3' below the lake bed. Sediment samples were analyzed for TCL SVOCs, PAHS, pesticides, PCBs, TAL metals, and cyanide using a ponar dredge. Sediment sample results were compared to10 times the human health-based EPA Region III RBCs (10XRBC) and the ecological-based Naval Academy brackish sediment criteria. Constituents identified in the sediments of Shady Lake which exceeded the 10XRBC include SVOCs (dibenz(a,h)anthracene). Several other SVOCs exceeded the more stringent Navy criteria. No pesticides/PCBs exceeded the 10XRBC criteria. One pesticide, eldrin, exceeded the Navy's more stringent sediment criteria. Metals above 10XRBC include arsenic, iron, and thallium. The HHRA identified risks above EPA acceptable limits for ingestion of fish from Shady Lake and the July 2002 site visit and collection of fish and crab tissue samples from Shady Lake was conducted. Risk analysis of the 2002 tissue data revealed risk levels within EPA acceptable limits for expected exposure to fish and crab in Shady Lake. See Page 6,
Sections a. and b.

f) During the Phase II RCRA Facility Investigation, subsurface soil samples were collected from twenty-six locations in the area of SMWU 13 at various depths. The subsurface soil samples were analyzed for a variety of constituents including TCL SVOCs, PAHs, pesticides, PCBs, dioxins, TAL metals, and cyanide. Soil borings were advanced to the depth of the top of the shallow water-bearing unit, or an average depth of approximately 13 feet below ground surface (bgs). Continuous split-spoon samples were collected to describe the lithology at each borehole.

References: (1) Draft Final Solid Waste Management Unit (SWMU) 13 Phase II RCRA Facility Investigation United States Naval Academy Annapolis, Maryland (May 2001); (2) Preliminary RCRA Facility Investigation (CH2M Hill, June 1998); (3) Verification Investigation (Baker, 1994)
(4) USNA Shady Lake Data Validation Summary Report (CH2MHILL, July, 2003).

3. Are there complete pathways between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

Contaminated	Residen	Worker	Day	Co	T	R	Food
~~Groundwater~~							
~~Air (indoors)~~							
Soil (surface,	yes	yes	no	ye	y	y	no
~~Surface Water~~							
Sediment		no			n		
Soil	no						no
~~Air (outdoors)~~							

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated" as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

__X__ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code.

Rationale and Reference(s): See Page 5.

a) Based on the results of the Human Health Risk Assessment (HHRA), potential human health cancer risks for current exposures are within acceptable EPA limits for all receptors. Potential non-cancer hazard quotients (segregated by target organ) for current receptors are below the acceptable EPA limit for all constituents and receptors, with the exception of iron exposure by a resident child at SWMU 13. Surface soil data generated during the Preliminary and Phase II RFIs were used in the risk assessment. With regard to iron concentrations reported in soil at this SWMU, it is notable that similar iron concentrations were reported in soil samples obtained from outside the SWMU boundaries at other locations on Naval Academy property, suggesting that reported iron concentrations are not a result of a SWMU-related release. Additional studies are being conducted to statistically determine background concentrations of iron and other metals at the Naval Academy property. The HHRA, which is currently contained in the Draft Final Phase II RFI will be supplemented to evaluate background concentrations of metals.

b) The HHRA evaluated the human health risk associated with exposure to contaminated sediments in Shady Lake and determined that potential human health cancer risks as well as target-organ specific hazard quotients are within acceptable EPA limits for all receptors under current site conditions. The HHRA identified risks above EPA acceptable limits for ingestion of fish from Shady Lake. The July 2002 site visit and collection of fish and crab tissue samples from Shady Lake was conducted. Risk analysis of the 2002 tissue data revealed risk levels within EPA acceptable limits for expected exposure to fish and crab in Shady Lake.

c) The ash and cinder layers which exhibit the highest SVOC and metals concentrations in subsurface soil are present at depths greater than 8' bgs. Therefore, there is no current potential exposure of on- site workers because institutional controls are currently in-place through the USNA Digging Permit Program to prevent on-site workers from drilling or digging utility lines into contaminated subsurface soil. Additionally, on-site workers are informed about the presence of subsurface contaminants. In addition to the reports referenced in #2 above, USNA provided information on the institutional controls present at the facility to prevent exposure to surface and subsurface soil contaminants.

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4. Can the exposures from any of the complete pathways identified in #3 be reasonably expected to be "significant"[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

__X__ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

With the exception of iron, exposure to surface soil at this site is not expected to result in unacceptable risks. Furthermore, exposure to iron-containing soil at SWMU 13 is not reasonably expected to be significant because most of the areas where samples were obtained are not accessible to human receptors. The revised HHRA will evaluate concentrations of iron and other metals to determine whether elevated levels are typical of regional metals concentrations.

In 2003, the Shady Lake sediments were evaluated through additional fish and crab studies that reveal no unacceptable risks at SWMU 13. See EPA Memo, Quinn E., August 28, 2003.

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5. Can the “significant” exposures (identified in #4) be shown to be within acceptable limits?

__X__ If yes (all “significant” exposures have been shown to be within acceptable limits) - continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

If no (there are current exposures that can be reasonably expected to be “unacceptable”)- continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.

If unknown (for any potentially “unacceptable” exposure) - continue and enter “IN” status code

Rationale and Reference(s):

Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

X YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the _UNITED STATES NAVAL ACADEMY facility, EPA ID #MD0170022602, located at 181 WAINWRIGHT RD, ANNAPOLIS, MD, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature)_____/s/_____ Date: 9/15/03

(print) Vernon Butler

(title) Remedial Project Manager

Supervisor (signature)_____ /s/_____ Date: 9/15/03

(print) Bob Greaves

(title) Chief, RCRA Operations Branch
U.S.EPA

Locations where References may be found: EPA Region III RCRA File Room

Contact telephone and e-mail numbers:

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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.